

AMENDMENTS TO THE SPECIFICATION:

Page 1, please amend the first paragraph as follows:

The present invention relates to a reactive blue dye, and more particularly to a reactive blue dye represented by the following Formula 1, which is effective in black dyeing or printing of polyamide textiles, in particular, nylon-fibre fiber.

Page 1, please amend the third paragraph as follows:

Polyamide textiles, especially nylon-fibre fiber, have drawn much attention as a material for sportswear. In general, acid dyes are used for dyeing or printing of nylon-fibre fiber. However, when acid dyes are used for heavy color dyeing, the result of washing fastness becomes poor. Binders are often used to solve this problem, but they have drawbacks such as high cost and the deterioration of touch. Metal complex acid dyes used for high light fastness are undesirable in terms of environmental contamination related to heavy metals.

Page 2, please amend the first paragraph as follows:

Japanese Patent Unexamined Publication No. Sho 43-15299 discloses an H-acid derived monofunctional disazo blue dye, which is obtained by

diazotization of ~~4-aminophenyl- β -sulfatoethylsulfone~~ 4-aminophenyl- β -sulfatoethylsulphone represented by the following Formula A.

Page 2, please amend the third paragraph as follows:

Since the ~~4-aminophenyl- β -sulfatoethylsulfone~~ 4-aminophenyl- β -sulfatoethylsulphone substituted monofunctional blue dye is highly soluble in water, it is separated by salting out using a large amount of salts. In the process, wastewater contaminated with the concentrated dyes and salts is generated. When this dye is applied for dyeing, the dyeing efficiency is poor because of the low substantivity of the dye as well as the concentrated wastewater of the unfixed dyes is generated, thereby increasing the cost for the wastewater treatment. Also, due to the increasing demand on the use of liquefied dyes considering workers' health and automation of dyeing processes, a concentrate dye with low salt content is highly required.

Page 2, please amend the fourth paragraph (continuing on to page 3) as follows:

As another blue dye, ~~4-aminophenyl-vinylsulfone~~ vinylsulphone (Formula B) substituted dye is reported [Ho Jung Cho and D. M. Lewis, *Coloration Technology*, 2002, 116,198-204][[.]] ~~to be less soluble to the in~~ water than the ~~4-aminophenyl- β -sulfatoethylsulfone~~ 4-aminophenyl- β -sulfatoethylsulphone (Formula A) substituted dye, it is more advantageous in salting out. In fact, because no salt is added during the separation of

the 4-aminophenyl-vinylsulfone vinylsulphone (Formula B) the salt content of the wastewater can be reduced.

Page 3, please amend the second full paragraph as follows:

The present inventors tried to develop a new reactive dye for dyeing or printing of polyamide textiles, which has good substantivity, superior cleaning properties over unfixed dyes, and good color yield, reactivity, and fixing efficiency. As a result, we synthesized a novel reactive blue dye by introducing diazo phenyl radicals, particularly 4-aminophenyl-vinylsulfone vinylsulphone radical and 4-aminoacetanilide radical respectively, into H-acid.

Page 4, please amend the second full paragraph as follows:

The present invention relates to a blue dye used for heavy color dyeing, especially for black dyeing of polyamide textiles, and more particularly to a reactive blue dye containing a functional group that can form a covalent bond with the amine group of polyamide textiles thus being effective in black dyeing or printing of polyamide textiles. The novel reactive blue dye of the present invention as shown in Formula 1 is derived from H-acid where 4-aminophenyl-vinylsulfone vinylsulphone and 4-aminoacetanilide are diazotized and coupled at C-2 and C-7, respectively.

Page 5, please amend the first full paragraph as follows:

The preparation process of Scheme 1 comprises the following two steps:

a) a step of diazotization of 4-aminophenyl-~~vinylsulfone~~ vinylsulphone represented by Formula 2 and the first coupling reaction with ~~1-naphthol-8-amino-3,6-disulfonic~~ 1-naphthol-8-amino-3,6-disulphonic acid represented by Formula 4; and b) a step of diazotization of 4-aminoacetanilide represented by Formula 3 and the second coupling reaction with the solution resulted from the step a).

Page 6, please amend the first full paragraph as follows:

The coupling reactions for the introduction of azo groups on the C-2 and C-7 of ~~1-naphthol-8-amino-3,6-disulfonic~~ 1-naphthol-8-amino-3,6-disulphonic acid represented by Formula 4 are carried out in two stages. In the first, coupling reaction of the diazo component, represented by Formula 2', is achieved in the introduction of the 4-aminophenyl-~~vinylsulfone~~ vinylsulphone group on the C-2 of ~~1-naphthol-8-amino-3,6-disulfonic~~ 1-naphthol-8-amino-3,6-disulphonic acid, represented by Formula 4, under the condition of 5 to 10°C and pH 1.0 to 2.0. Under the condition of 5 to 10°C and pH 6.5 to 7.5 the diazo component of 4-aminoacetanilide represented by Formula 3', is introduced onto the C-7 of ~~1-naphthol-8-amino-3,6-disulfonic~~ 1-naphthol-8-amino-3,6-disulphonic acid, represented by Formula 4, that is called the second coupling reaction. Through the first and the second coupling reactions is obtained a reactive blue dye of the present invention represented by Formula 1.

Page 6, please amend the Example step 1 title as follows:

(1) Diazotization of 4-aminophenyl-~~vinylsulfone~~ vinylsulphone and first coupling reaction

Page 6, please amend the third paragraph (continuing on page 7) as follows:

To the 25mL of water in a beaker 1.85g (99%, 0.01 mol) of 4-aminophenyl-~~vinylsulfone~~ vinylsulphone was added. While stirring, the suspension was cooled down to 5°C using an ice bath. To this mixture 3.67mL (3N, 0.011 mol) of NaNO₂ and 5g of ice were added. Then, 2.5mL of concentrated hydrochloric acid was added to obtain a diazo component of 4-aminophenyl-~~vinylsulfone~~ vinylsulphone. Excess HNO₂ was removed by adding a small amount of sulfamic acid.

Page 7, please amend the first full paragraph as follows:

To the 40mL of water in a beaker 3.9g (82%, 0.01 mol) of ~~1-naphthol-8-amino-3,6-disulfonic~~ 1-naphthol-8-amino-3,6-disulphonic acid was added. This solution was neutralized (pH =7) with 2.5mL of 4N NaOH aqueous solution and the ~~1-naphthol-amino-3,6-disulfonic~~ 1-naphthol-amino-3,6-disulphonic acid was completely dissolved. This aqueous solution was transferred to a dropping funnel and was added dropwise to the diazo component aqueous solution of 4-aminophenyl-~~vinylsulfone~~ vinylsulphone

while keeping the temperature at 0 to 5°C to complete the first coupling reaction.

Page 8, please amend the Comparative Example step 1 title as follows:

(1) Diazotization of ~~4-aminophenyl- β -sulfatoethylsulfone~~ 4-aminophenyl- β -sulfatoethylsulphone and first coupling reaction

Page 8, please amend the first full paragraph as follows:

To the 25mL of water in a beaker 2.96g (95%, 0.01 mol) of ~~4-aminophenyl- β -sulfatoethylsulfone~~ 4-aminophenyl- β -sulfatoethylsulphone was added. While stirring the suspension was cooled down to 5°C using an ice bath. To this solution 3.67mL (3N, 0.011 mol) of NaNO₂ and 5g of ice were added. Then, 2.6mL of concentrated hydrochloric acid was added to obtain a diazo component of ~~4-aminophenyl- β -sulfatoethylsulfone~~ 4-aminophenyl- β -sulfatoethylsulphone. Excess HNO₂ was removed by adding a small amount of sulfamic acid.

Page 9, please amend the first full paragraph as follows:

To another beaker 3.9g (82%, 0.01 mol) of ~~1-naphthol-8-amino-3,6-disulfonic~~ 1-naphthol-8-amino-3,6-disulphonic acid and 40mL of water were added. This solution was neutralized (pH =7) with 2.5mL of 4N NaOH aqueous solution and the ~~1-naphthol-8-amino-3,6-disulfonic~~ 1-naphthol-8-amino-3,6-disulphonic acid was completely dissolved. This

aqueous solution was transferred to a dropping funnel and was added dropwise to the diazo component aqueous solution of 4-aminophenyl-~~vinylsulfone~~ vinylsulphone while keeping the temperature at 0 to 5°C to complete the first coupling.

Page 10, please amend the first full paragraph, first sentence as follows:

The reactive blue dyes prepared in Example and Comparative Example were applied to nylon-~~fibre~~ fiber by exhaustion dyeing method, and dyeing efficiency and light fastness were measured.

Page 11, please amend the first full paragraph as follows:

As shown in Table 1, the reactive blue dye of the present invention (Example), which has the 4-aminophenyl-~~vinylsulfone~~ vinylsulphone group and the 4-aminoacetanilide group, showed much superior dyeing efficiency than the reactive blue dye (Comparative Example), which has the 4-aminophenyl- ~~β -sulfatoethylsulfone~~ 4-aminophenyl- β -sulfatoethylsulphone group. And, while there was no difference in washing fastness, the reactive blue dye of the present invention showed improved light fastness.

Page 11, please amend the second full paragraph (continuing on page 12) as follows:

The visible absorption spectrum of the reactive blue dye of the present invention ($\lambda_{\max} = 626.2\text{nm}$, $\epsilon_{\text{mol/l}} = 5.6 \times 10^4$, $\epsilon_{\text{g/l}} = 77.99$) was compared with that of the CI Reactive Black 5 ($\lambda_{\max} = 598.8\text{nm}$, $\epsilon_{\text{mol/l}} = 3.7 \times 10^4$, $\epsilon_{\text{g/l}} = 49.27$). The λ_{\max} shifted toward the longer wavelength ($\Delta\lambda = 27.4\text{nm}$) and the light absorbance increased. Accordingly, when the reactive blue dye of the present invention is applied for dyeing or printing of nylon-fibre fiber, superior color yield, fixing efficiency, light fastness, and washing fastness can be obtained economically.

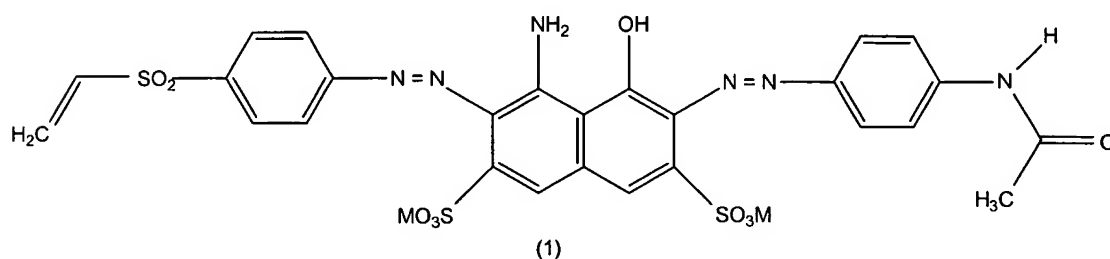
Page 12, please amend the first full paragraph as follows:

As explained in detail above, the reactive blue dye of the present invention has improved dyeing efficiency and washing fastness by introducing the 4-aminophenyl-vinylsulfone vinylsulphone group, which is capable of forming a covalent-bonding bond with the amine group of nylon-fibre fiber. In addition, the water-solubility of the dye is lowered, and thus no salt is added during the separation process. Consequently, a high pure dye can be obtained and the salt content of the wastewater can be reduced. While the present invention has been described in detail with reference to the preferred embodiments, those skilled in the art will appreciate that various modifications and substitutions can be made thereto without departing from the spirit and scope of the present invention as set forth in the appended claims.

Page 15 (Abstract), please amend the abstract of the disclosure, first paragraph as follows:

ABSTRACT OF THE DISCLOSURE

The present invention relates to a reactive blue dye, and more particularly to a reactive blue dye represented by the following Formula 1, which is effective in black dyeing or printing of polyamide textiles, in particular, ~~nylon-fibre~~ fiber,



wherein M is a hydrogen atom or an alkali metal atom.

The blue dye of the present invention offers superior color yield, reactivity, fixing efficiency, light fastness, and washing fastness, substantivity, and superior cleaning properties over unfixed dyes.

Attachments: Replacement abstract